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DOE/ET/47927-8

Glass Analog Study
PROJECT STATUS REPORT

Date of Report: 4/2/81

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Report Period: January 1 thru April 10, 1981

DE85 007115

WBS Work Element No. 13155

Contract Title and No.:

Glass Analog Study: DE-A109-80ET47927

Contractor: NASA/Goddard Space Flight Center, Greenbelt, MD 20771

Contract Period: April 18, 1980 to April 17, 1981

Contract Work Element Activities:

At the University of Delaware, B.P. Glass and his students are examining small spheres of tektite glass (microtektites) 1000 micrometers to 4 micrometers in diameter, which were utilized by certain one-celled animals (arenaceous foraminifera) to build sand-tube shelters, some 35 m.y. ago. Glass has discovered some spheres of the minimum size still firmly attached to the sand-tubes, indicating that there the corrosion has been less than 2 micrometers. At another point two spherical microtektites are firmly attached to the sandtube, and separated by only 0.5 micrometers, indicating corrosion at a rate less than 0.02 micrometers per million years. He has also removed some microtektites from the sandtubes, and compared the areas which had been protected by cementation with those which had been exposed, using the fact that microtektites are generally spherical. He has not been able to establish any non-zero decay rate; the actual rate must be less than 5 micrometers in 35 m.y.

Preparation of a general study on tektite corrosion is under way at GSFC. It appears that corrosion on land is much more serious than at sea; however, rates of 0.1 mm/m.y. seem to be reasonable. The crucial point is not so much the chemical composition of the tektite as its physical shape. As would be expected from the theories of Hensch, attack is much more vigorous in enclosures or in cracks than on convex surfaces like those of the microtektites. Our attention has recently been drawn to some work by I. Prigogine, which establishes some general principles applicable to reactions which occur far from thermodynamic equilibrium, such as glass corrosion. Combining these ideas with Hensch's suggests that we may be able to explain certain very puzzling kinds of corrosion observed particularly on tektites from the island of Anda, in the Philippines.

As a result of fiscal restraints imposed upon NASA by the administration, the desired field trip to Australia has been delayed. (Hopefully these restraints will be removed in October). An intensive study has been made of the geological maps of SW Victoria, the critical area. It is noted there is a sharp conflict between the stratigraphy as given by the Geological Survey of Victoria and that put forward by E. Gill. If the GSV

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is right, then the conflict with the physical measurements of the ages is largely resolved. The ages derived from physical measurements yield corrosion rates around 0.1 mm/m.y.; those from Gill's work would yield 3.5 mm/./y.

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